SHELL POLISHES:
See Polishes.

SHELLAC:
See Varnishes.

SHELLAC BLEACHING.

In bleaching, shellac is brought into contact with an acidified solution of chloride of lime for some time, then washed, kneaded in hot water, placed back into the chloride of lime solution, and brushed. Through this treatment with the chloride of lime solution the bleached shellac sometimes loses its solubility in alcohol, which, however, can be restored if the shellac is melted in boiling water, or if it is moistened with a little ether in a well-closed vessel. A quantity of ether in the proportion of 1 part to 20 parts shellac is sufficient. Great caution is recommended in the handling of ether. The ether vapors easily ignite when in proximity to a burning light and a mixture of ether vapor and atmospheric air may cause most vehement explosions. After an action of the ether upon the shellac for several hours, the alcohol necessary to dissolve it may either be added directly or the shellac moistened with ether is placed in the open air for half an hour in a dish, after which time the ether will have evaporated and the shellac can then be dissolved by the use of alcohol.

Bleached shellac is known to lose its solubility in alcohol, especially if treated with chlorine in bleaching. This solubility can be readily restored, however, by first mositening the rosin with $\frac{1}{20}$ its weight of ether, placing it in a closed vessel and allowing it to swell there. Shellac thus treated becomes perfectly soluble again.

SHIMS IN ENGINE BRASSES.

In taking up the wear of engine brasses on wrist pin or crosshead pin when the key is driven clear down, back out the key and instead of putting in sheet-iron shims, put in a small piece of pine wood of just the right thickness to allow the key to come even with the under side of the strap, then pour in melted babbitt. A hole must be drilled through the flange of the brasses to allow for pouring the babbitt.

Every engineer knows the trouble it is to put several shims between the brass box and the end of the strap, especially if the box is a round-end one, as many are. By using the method described, brasses may be worn up much closer, even if worn through; the babbitt will form part of the bearing.

Shoe Dressings

(See also Leather.)

Acid-Free Blacking.—

Lampblack	27–36 parts
Bone black	3 parts
Syrup	60–70 parts

Put in a kettle and under gentle heat stir together until a smooth, homogeneous mass has been attained. In another kettle put 3 parts of finely shredded gutta percha and warm over an open fire until it begins to run, then add, with constant stirring, 5 parts of olive oil, continuing the heat until the gum is completely dissolved. When this occurs dissolve in 1 part of stearine, and add the whole while still hot in a slow stream, and under diligent and constant stirring, to the mixture of syrup and blacks. Continue the agitation of the mass until it is completely homogeneous. Now dissolve 4 parts of Senegal gum in 12 parts of water, and add the solution to the foregoing mass. Stir well in and finally add sufficient mirbane (about $\frac{1}{5}$ part) to perfume.

Blacking Pastes.—While shellac is not soluble in water alone, it is soluble in water carrying borax, the alkaline carbonates, etc. In paste blacking the object of the sulphuric acid is to remove from the bone black the residual calcium phosphate. The ordinary bone black of commerce consists of only about 10 per cent of carbon, the residue being chiefly calcium phosphate. This is the reason that we cannot obtain a pure black color from it, but a dirty brown. To make a good blacking, one that is of a black in color, either use purified bone black, or a mineral acid (sulphuric or hydrochloric acid) with crude bone black. The residual acid is entirely neutralized by the sodium carbonate and has no bad effect on the leather. The following formula contains no acid and makes a good paste:

I.—Marseilles soap	122 parts
Potassium carbonate	61 parts
Beeswax	500 parts
Water	2,000 parts

Mix and boil together with occasional stirring until a smooth, homogeneous paste is obtained, then add, a little at a time, and under constant stirring, the following:

Rock candy, powdered..........	153 parts
Gum arabic, powdered.........	61 parts
Ivory black......	1,000 parts

Stir until homogeneous, then pour, while still hot, into boxes.

The following makes a very brilliant and durable black polish for shoes:

II.—Bone black......	40 parts
Sulphuric acid...	10 parts
Fish oil.........	10 parts
Sodium carbonate crystal........	18 parts
Sugar, common brown, or molasses	20 parts
Liquid glue, prepared as below.	20 parts
Water, sufficient.	

Soak 10 parts of good white glue in 40 parts of cold water for 4 hours, then dissolve by the application of gentle heat, and add 1.8 parts of glycerine (commercial). Set aside. Dissolve the sodium carbonate in sufficient water to make a cold saturated solution (about 3 parts of water at 60° F.), and set aside. In an earthenware vessel moisten the bone black with a very little water, and stirring it about with a stick, add the sulphuric acid, slowly. Agitate until a thick dough-like mass is obtained, then add and incorporate the fish oil. Any sort of animal oil, or even colza will answer, but it is best to avoid high-smelling oils. Add a little at a time, and under vigorous stirring, sufficient of the saturated sodium carbonate solution to cause effervescence. Be careful not to add so freely as to liquefy the mass. Stir until effervescence ceases, then add the molasses or sugar, the first, if a soft, damp paste is desired, and the latter if a dryer one is wanted. Finally, add, a little at a time, and under constant stirring, sufficient of the solution of glue to make a paste of the desired consistency. The exact amount of this last ingredient that is necessary must be learned by experience. It is a very important factor, as it gives the finished product a depth and brilliancy that it could not otherwise have, as well as a certain durability, in which most of the blackings now on the market are deficient.

III.—Soap...........	122 parts
Potassium carbonate........	61 parts
Beeswax.........	500 parts
Water...........	2,000 parts

Mix and boil together until a smooth, homogeneous paste is obtained, then add

Bone black......	1,000 parts
Powdered sugar..	153 parts
Powdered gum arabic	61 parts

Mix thoroughly, remove from the fire, and pour while still hot into boxes.

Boot-Top Liquid.—

Solution of muriate of tin................	3 drachms
French chalk (in powder)..............	1 ounce
Salt of sorrel	½ ounce
Flake white.........	1 ounce
Burnt alum.........	½ ounce
Cuttle-fish bones (powdered).......	1 ounce
White arsenic.......	1 ounce
Boiling water........	1 quart

Brown Dressing for Untanned Shoes.—

Yellow wax.........	30 parts
Soap...............	12 parts
Nankin yellow.......	15 parts
Oil of turpentine.....	100 parts
Alcohol.............	12 parts
Water..............	100 parts

Dissolve in the water bath the wax in the oil of turpentine; dissolve, also by the aid of heat, the soap in the water, and the Nankin yellow (or in place of that any of the yellow coal-tar colors) in the alcohol. Mix the solutions while hot, and stir constantly until cold. The preparation is smeared over the shoes in the usual way, rubbed with a brush until evenly distributed, and finally polished with an old silk or linen cloth.

Heel Polish.—

I.—Carnauba wax....	5 parts
Japanese wax.....	5 parts
Paraffine.........	5 parts
Oil of turpentine..	50 parts
Lampblack	1 part
Wine black.......	2 parts

Melt the wax and the paraffine, and when this has become lukewarm, add the turpentine oil, and finally the lampblack and the wine black. When the black color has become everly distributed, pour, while still lukewarm, into tin cans.

II.—Melt together Japanese wax, 100 parts; carnauba wax, 100 parts; paraffine, 100 parts; and mix with turpentine oil, 500 parts, as well as a trituration of lampblack, 10 parts; wine black, 20 parts; turpentine oil, 70 parts.

LIQUID BLACKINGS.

The following formulas make a product of excellent quality:

I.—Ivory black.......	120 parts
Brown sugar......	90 parts
Olive oil.........	15 parts
Stale beer........	500 parts

Mix the black, sugar and olive oil into a smooth paste, adding the beer, a little at a time, under constant stirring. Let stand for 24 hours, then put into flasks, lightly stoppered.

II.—Ivory black.......	200 parts
Molasses.........	200 parts
Gallnuts, bruised.	12 parts
Iron sulphate.....	12 parts
Sulphuric acid....	40 parts
Boiling water.....	700 parts

Mix the molasses and ivory black in an earthen vessel. In an iron vessel let the gallnuts infuse in 100 parts of boiling water for 1 hour, then strain and set aside. In another vessel dissolve the iron sulphate; in another, 100 parts of the boiling water. One-half of this solution is added at once to the molasses mixture. To the remaining half add the sulphuric acid, and pour the mixture, a little at a time, under constant stirring, into the earthen vessel containing the molasses mixture. The mass will swell up and thicken, but as soon as it commences to subside, add the infusion of gallnuts, also under vigorous stirring. If a paste blacking is desired the preparation is now complete. For a liquid black add the remaining portion of the boiling water (500 parts), stir thoroughly and bottle.

Patent-Leather Polish.—

Yellow wax or ceresine	3 ounces
Spermaceti..........	1 ounce
Oil of turpentine.....	11 ounces
Asphaltum varnish...	1 ounce
Borax...............	80 grains
Frankfort black......	1 ounce
Prussian blue........	150 grains

Melt the wax, add the borax, and stir until an emulsion has been formed. In another pan melt the spermaceti; add the varnish, previously mixed with the turpentine; stir well and add to the wax; lastly add the colors.

Preservatives for Shoe Soles.—I.—This preparation, destined for impregnating leather shoe soles, is produced as follows: Grind 50 parts of linseed oil with 1 part of litharge; next heat for 2 hours to the boiling point with ¼ part of zinc vitriol, which is previously calcined (dehydrated). The composition obtained in this manner, when perfectly cold, is mixed with 8 parts of benzine and filled in bottles or other receptacles. To render this preservative effective, the soles must be coated with it until the leather absorbs it.

II.—Dissolve ordinary household soap in water; on the other hand, dissolve an aluminum salt—the cheapest is the commercial aluminum sulphate—in water and allow both solutions to cool. Now pour the aluminum salt solution, with constant stirring, into the soap solution, thereby obtaining a very fine precipitate of aluminum oleate. The washed-out residue is dried with moderate heat. By adding 10 to 30 per cent to petroleum with slight heating, a solid petroleum of vaseline-like consistency is received, which may be still further solidified by additional admixture. A 10 per cent solution of aluminum oleate in petroleum is a very excellent agent for preserving the soles, a single saturation of the soles sufficing forever. The sole will last about 1 year.

III.—The following mixture is prepared by melting together over the fire in an enameled iron vessel: Vaseline, 400 parts; ceresine, 100 parts. The melted mass, which is used as a grease, is filled in wooden boxes or tin cans.

IV.—The oleic acid of the stearine factories is heated with strong alcohol and sulphuric acid. Take 16 parts of oleic acid, 2 parts of alcohol (90 per cent), and 1 part of concentrated sulphuric acid. The oleic-acid ether formed separates as a thin brownish oil. It is liberated from free sulphuric acid and the alcohol in excess by agitation with warm water and allowing to settle. This oleic-acid ether is mixed with the same weight of fish oil, and 4 to 8 parts of nitro-benzol are added per 1,000 parts to disguise the odor.

TAN AND RUSSET SHOE POLISHES:

To Renovate and Brighten Russet and Yellow Shoes.—First, clean off all dirt and dust with a good stiff brush, then with a sponge dipped in benzine go over the leather, repeating the process as soon as the benzine evaporates. A few wipings will bring back the original color. Then use a light-yellow dressing and brush well.

The liquid application consists usually of a solution of yellow wax and soap in oil of turpentine, and it should be a matter of no difficulty whatever to compound a mixture of this character at least equal

to the preparations on the market. As a type of the mixture occasionally recommended we may quote the following:

I.—Yellow wax	4 ounces
Pearl ash	4 drachms
Yellow soap	1 drachm
Spirit of turpentine	7 ounces
Phosphine (aniline)	4 grains
Alcohol	4 drachms
Water, a sufficient quantity.	

Scrape the wax fine and add it, together with the ash and soap, to 12 ounces of water. Boil all together until a smooth, creamy mass is obtained; remove the heat and add the turpentine and the aniline (previously dissolved in the alcohol). Mix thoroughly, and add sufficient water to bring the finished product up to 1½ pints.

II.—Water	18 parts
Rosin oil	4½ parts
Spirit of sal ammoniac, concentrated	1⅕ parts
White grain soap	1.93 parts
Russian glue	1.59 parts
Brown rock candy	0.57 parts
Bismarck brown	0.07 parts

Boil all the ingredients together, excepting the pigment; after all has been dissolved, add the Bismarck brown and filter. The dressing is applied with a sponge.

III.—Beeswax, yellow	2 ounces
Linseed oil	3 ounces
Oil turpentine	10 ounces

Dissolve by heat of a water bath, and add 1¼ ounces soap shavings, hard yellow. Dissolve this in 14 ounces of hot water.

IV.—A simpler form of liquid mixture consists of equal parts of yellow wax and palm oil dissolved with the aid of heat in 3 parts of oil of turpentine.

V.—Soft or green soap	1 ounce
Linseed oil, raw	2 ounces
Annatto solution (in oil)	7 ounces
Yellow wax	2 ounces
Gum turpentine	7 ounces
Water	7 ounces

Dissolve the soap in the water and add the solution of annatto; melt the wax in the oil of turpentine, and gradually stir in the soap solution, stirring until cold.

The paste to accompany the foregoing mixtures is composed of yellow wax and rosin thinned with petrolatum, say 4 parts of wax, 1 part of rosin, and 12 parts of petrolatum.

Paste Dressings for Russet Shoes.—The paste dressings used on russet leather consist of mixtures of wax with oil and other vehicles which give a mixture of proper working quality.

A simple formula is:

I.—Yellow wax	9 parts
Oil of turpentine	20 parts
Soap	1 part
Boiling water	20 parts

Dissolve the wax in the turpentine on a water bath and the soap in the water and stir the two liquids together until the mixture becomes sufficiently cold to remain homogeneous.

Another formula in which stearine is used is appended:

II.—Wax	1 part
Stearine	2 parts
Linseed oil	1 part
Oil of turpentine	6 parts
Soap	1 part
Water	10 parts

Proceed as above.

Carnauba wax is often used by manufacturers of such dressings instead of beeswax, as it is harder and takes a higher polish. These dressings are sometimes colored with finely ground yellow ocher or burnt umber. If the leather be badly worn, however, it is best to apply a stain first, and afterwards the waxy dressing.

Suitable stains are made by boiling safflower in water, and annatto is also used in the same way, the two being sometimes mixed together. Oxalic acid darkens the color of the safflower. Aniline colors would also doubtless yield good results with less trouble and expense. By adding finely ground lampblack to the waxy mixture instead of ocher, it would answer as a dressing for black leather.

WATERPROOF SHOE DRESSINGS.

I.—Caoutchouc	10 parts
Petroleum	10 parts
Carbon disulphide	10 parts
Shellac	40 parts
Lampblack	20 parts
Oil lavender	1 part
Alcohol	200 parts

Upon the caoutchouc in a bottle pour the carbon disulphide, cork well, and let stand a few days, or until the caoutchouc has become thoroughly gelatinized or partly dissolved. Then add the petroleum, oil of lavender, and alcohol, next the shellac in fine powder, and heat it to about 120° F., taking care that as little as possible is lost by evaporation. When the substances are all dissolved and the liquid is tolerably clear, add the lamp-

black, mix thoroughly, and fill at once into small bottles.

II.—A waterproof blacking which will give a fine polish without rubbing, and will not injure the leather:

Beeswax	18 parts
Spermaceti	6 parts
Turpentine oil	66 parts
Asphalt varnish	5 parts
Powdered borax	1 part
Frankfort black	5 parts
Prussian blue	2 parts
Nitro-benzol	1 part

Melt the wax, add the powdered borax and stir till a kind of jelly has formed. In another pan melt the spermaceti, add the asphalt varnish, previously mixed with the oil of turpentine, stir well, and add to the wax. Lastly add the color previously rubbed smooth with a little of the mass. The nitro-benzol gives fragrance.

Waterproof Varnish for Beach Shoes.—

Yellow.—

Water	150 parts
Borax	5 parts
Glycerine	3 parts
Spirit of ammonia	1 part
White shellac	25 parts
Yellow pigment, water soluble	1 part
Formalin, a few drops.	

Orange.—

Water	150 parts
Borax	5 parts
Glycerine	2 parts
Spirit of ammonia	1 part
Ruby shellac	22 parts
Orange, water soluble	1 part
Brown	0.3 parts
Formalin	0.1 part

Pale Brown.—

Water	150 parts
Borax	5 parts
Glycerine	2 parts
Spirit of ammonia	0.25 parts
White shellac	25 parts
Yellow, water soluble	8 parts
Orange	0.3 parts
Formalin	0.1 part

Stir the glycerine and the spirit of ammonia together in a special vessel before putting both into the kettle. It is also advisable, before the water boils, to pour a little of the nearly boiling water into a clean vessel and to dissolve the colors therein with good stirring, adding this solution to the kettle after the shellac has been dissolved.

White Shoe Dressing.—

I.—Cream of tartar	3 ounces
Oxalic acid	1 ounce
Alum	1 ounce
Milk	3 pints

Mix and rub on the shoes. When they are thoroughly dry, rub them with a mixture of prepared chalk and magnesium carbonate.

II.—Water	136 parts
Fine pipe clay	454 parts
Shellac, bleached	136 parts
Borax, powdered	68 parts
Soft soap	8 parts
Ultramarine blue	5 parts

Boil the shellac in the water, adding the borax, and keeping up the boiling until a perfect solution is obtained, then stir in the soap (5 or 6 parts of "ivory" soap, shaved up, and melted with 2 or 3 parts of water, is better than common soft soap), pipe clay, and ultramarine. Finally strain through a hair-cloth sieve. This preparation, it is said, leaves absolutely nothing to be desired. A good deal of stiffness may be imparted to the leather by it. The addition of a little glycerine would remedy this. The old application should be wiped away before a new one is put on. This preparation is suitable for military shoes, gloves, belts, and uniforms requiring a white dressing.

SHOES, WATERPROOFING:
See Waterproofing.

SHIO LIAO:
See Adhesives, under Cements.

SHIP COMPOSITIONS AND PAINTS:
See Paints.

SHOW BOTTLES FOR DRUGGISTS:
See Bottles.

SHOW CASES.

Dents in show cases and counters, and, indeed, almost all forms of "bruises" on shop and other furniture, may be removed by the exercise of a little patience, and proceeding as follows: Sponge the place with water as warm as can be borne by the hand. Take a piece of filtering or other bibulous paper large enough to fold 6 or 8 times and yet cover the bruise, wet in warm water and place over the spot. Take a warm (not hot) smoothing iron and hold it on the paper until the moisture is evaporated (renewing its heat, if necessary). If the bruise does not yield to the first trial, repeat the process. A dent as large as a

dollar and ¼ inch deep in the center, in black walnut of tolerably close texture, was brought up smooth and level with the surrounding surface by two applications of the paper and iron as described. If the bruise be small, a sponge dipped in warm water placed upon it, renewing the warmth from time to time, will be all-sufficient. When the dent is removed and the wood dry, the polish can be restored by any of the usual processes. If the wood was originally finished in oil, rub with a little boiled linseed cut with acetic acid (oil, 8 parts; acid, 1 part). If it was "French polished," apply an alcoholic solution of shellac, and let dry; repeat if necessary, and when completely dry proceed as follows: Rub the part covered with shellac, first with crocus cloth and a few drops of olive oil, until the ridges, where the new and old polish come together, disappear; wipe with a slightly greased but otherwise clean rag and finish with putz pomade.

SHOW-CASE SIGNS:
See Lettering.

SHOW-CASES, TO PREVENT DIMMING OF:
See Glass.

Siccatives

The oldest drier is probably litharge, a reddish-yellow powder, consisting of lead and oxygen. Formerly it was ground finely in oil, either pure or with admixture of white vitriol and added to the dark oil paints. Litharge and sugar of lead are used to-day only rarely as drying agents, having been displaced by the liquid manganese siccatives, which are easy to handle. E. Ebelin, however, is of the opinion that the neglect of the lead compounds has not been beneficial to decorative painting. Where these mediums were used in suitable quantities hard-drying coatings were almost always obtained. Ebelin believes that formerly there used to be less lamentation on account of tacky floors, pews, etc., than at the present time.

Doubtless a proposition to grind litharge into the oil again will not be favorably received, although some old master painters have by no means discarded this method.

Sugar of lead (lead acetate) is likewise used as a drier for oil paint. While we may presume in general that a siccative acts by imparting its oxygen to the linseed oil or else prepares the linseed oil in such a manner as to render it capable of readily absorbing the oxygen of the air, it is especially sugar of lead which strengthens us in this belief. If, according to Leuchs, a piece of charcoal is saturated with lead acetate, the charcoal can be ignited even with a burning sponge, and burns entirely to ashes. (Whoever desires to make the experiment should take 2 to 3 parts, by weight, of sugar of lead per 100 parts of charcoal.) This demonstrates that the sugar of lead readily parts with its oxygen, which though not burning itself, supports the combustion. Hence, it may be assumed that it will also as a siccative freely give off its oxygen.

Tormin reports on a siccative, of which he says that it has been found valuable for floor coatings. Its production is as follows: Pour 1 part of white lead and 1½ parts each of litharge, sugar of lead and red lead to 12½ parts of linseed oil, and allow this mixture to boil for 8 to 10 hours. Then remove the kettle from the fire and add to the mixture 20 parts of oil of turpentine. During the boiling, as well as during and after the pouring in of the oil turpentine, diligent stirring is necessary, partly to prevent anything from sticking to the kettle (which would render the drier impure) and partly to cause the liquid mass to cool off sooner. After that, it is allowed to stand for a few days, whereby the whole will clarify. The upper layer is then poured off and added to the light tints, while the sediment may be used for the darker shades.

If white vitriol (zinc sulphate or zinc vitriol) has been introduced among the drying agents, this is done in the endeavor to create a non-coloring admixture for the white pigments and also not to be compelled to add lead compounds, which, as experience has shown, cause a yellowing of white coatings to zinc white. For ordinary purposes, Dr. Koller recommends to add to the linseed oil 2 per cent (by weight) of litharge and ½ per cent of zinc vitriol, whereupon the mixture is freely boiled. If the white vitriol is to be added in powder form, it must be deprived of its constitutional water. This is done in the simplest manner by calcining. The powder, which feels moist, is subjected to the action of fire on a sheet-iron plate, whereby the white vitriol is transformed into a vesicular, crumbly mass. At one time it was ground in oil for pure zinc white coatings only, while for the other pigments litharge is added besides, as stated above.

As regards the manganese preparations which are employed for siccatives, it must be stated that they do not possess

certain disadvantages of the lead preparations as, for instance, that of being acted upon by hydrogen sulphide gas. The ordinary brown manganese driers, however, are very liable to render the paint yellowish, which, of course, is not desirable for pure white coatings. In case of too large an addition of the said siccative, a strong subsequent yellowing is perceptible, even if, for instance, zinc white has been considerably "broken" by blue or black. But there are also manganese siccatives or drying preparations offered for sale which are colorless or white, and therefore may unhesitatingly be used in comparatively large quantities for white coatings. A pulverulent drying material of this kind consists, for example, of equal parts of calcined (i. e., anhydrous) manganese vitriol, manganous acetate, and calcined zinc vitriol. Of this mixture 3 per cent is added to the zinc white. Of the other manganese compounds, especially that containing most oxygen, viz., manganic peroxide, is extensively employed. This body is treated as follows: It is first coarsely powdered, feebly calcined, and sifted. Next, the substance is put into wire gauze and suspended in linseed oil, which should be boiled slightly. The weight of the linseed oil should be 10 times that of the manganese peroxide.

According to another recipe a pure pulverous preparation may be produced by treating the manganic peroxide with hydrochloric acid, next filtering, precipitating with hot borax solution, allowing to deposit, washing out and finally drying. Further recipes will probably be unnecessary, since the painter will hardly prepare his own driers.

Unless for special cases driers should be used but sparingly. As a rule 3 to 5 per cent of siccative suffices; in other words, 3 to 5 pounds of siccative should be added to 100 pounds of ground oil paint ready for use. As a standard it may be proposed to endeavor to have the coating dry in 24 hours. For lead colors a slight addition of drier is advisable; for red lead, it may be omitted altogether. Where non-tacky coatings are desired, as for floors, chairs, etc., as well as a priming for wood imitations, lead color should always be employed as foundation, and as a drier also a lead preparation. On the other hand, no lead compounds should be used for pure zinc-white coats and white lacquering.

Testing Siccatives.—Since it was discovered that the lead and manganese compounds of rosin acids had a better and more rapid action on linseed oil than the older form of driers, such as red lead, litharge, manganese dioxide, etc., the number of preparations of the former class has increased enormously. Manufacturers are continually at work endeavoring to improve the quality of these compounds, and to obtain a preparation which will be peculiarly their own. Consequently, with such a large variety of substances to deal with, it becomes a matter of some difficulty to distinguish the good from the bad. In addition to the general appearance, color, hardness, and a few other such physical properties, there is no means of ascertaining the quality of these substances except practical testing of their drying properties, that is, one must mix the driers with oil and prove their value for oneself. Even the discovery of an apparently satisfactory variety does not end the matter, for experience has shown that such preparations, even when they appear the same, do not give similar results. A great deal depends upon their preparation; for example, manganese resinate obtained from successive consignments, and containing the same percentage of manganese, does not always give identical results with oil. In fact, variation is the greatest drawback to these compounds. With one preparation the oil darkens, with another it remains pale, or sometimes decomposition of the oil takes place in part. The addition of a small proportion of drier has been known to cause the separation of 50 per cent of the oil as a dark viscous mass. One drier will act well, and the oil will remain thin, while with another, the same oil will in the course of a few months thicken to the consistency of stand oil. These various actions may all be obtained from the same compound of the rosin with a metal, the source only of the drier varying.

The liquid siccatives derived from these compounds by solution in turpentine or benzine also give widely divergent results. Sometimes a slight foot will separate, or as much as 50 per cent may go to the bottom of the pan, and at times the whole contents of the pan will settle to a thick, jelly-like mass. By increasing the temperature, this mass will become thin and clear once more, and distillation will drive over pure unaltered turpentine or benzine, leaving behind the metallic compound of rosin in its original state.

The compounds of metals with fatty acids which, in solution in turpentine, have been used for many years by var-

nish-makers, show even greater variation. At the same time, a greater drying power is obtained from them than from rosin acids, quantities being equal. As these compounds leave the factory, they are often in solution in linseed oil or turpentine, and undoubtedly many of the products of this nature on the market are of very inferior quality.

The examination of these bodies may be set about in two ways:

A.—By dissolving in linseed oil with or without heat.

B.—By first dissolving the drier in turpentine and mixing the cooled solution (liquid siccatives) with linseed oil.

Before proceeding to describe the method of carrying out the foregoing tests, it is necessary to emphasize the important part which the linseed oil plays in the examination of the driers. As part of the information to be gained by these tests depends upon the amount of solid matter which separates out, it is essential that the linseed oil should be uniform. To attain this end, the oil used must always be freed from mucilage before being used for the test. If this cannot readily be obtained, ordinary linseed oil should be heated to a temperature of from 518° to 572° F., so that it breaks, and should then be cooled and filtered. With the ordinary market linseed oil, the amount of solid matter which separates varies within wide limits, so that if this were not removed, no idea of the separation of foot caused by the driers would be obtained. It is not to be understood from this that unbroken linseed oil is never to be used for ordinary paint or varnish, the warning being only given for the sake of arriving at reliable values for the quality of the driers to be tested.

A.—Solution of Drier in Linseed Oil.—The precipitated metallic compounds of rosin (lead resinate, manganese resinate and lead manganese resinate) dissolve readily in linseed oil of ordinary temperature (60° to 70° F.). The oil is mixed with 1½ per cent of the drier and subjected to stirring or shaking for 24 hours, the agitation being applied at intervals of an hour. Fused metallic resinates are not soluble in linseed oil at ordinary temperatures, so different treatment is required for them. The oil is heated in an enameled pan together with the finely powdered drier, until the latter is completely in solution, care being taken not to allow the temperature to rise above 390° F. The pan is then removed from the fire and its contents allowed to settle. The quantity of drier used should not exceed 1½ to 3 per cent. In the case of metallic linoleates (lead linoleate, manganese linoleate and lead-manganese linoleate), the temperature must be raised above 290° F. before they will go into solution. In their case also the addition should not be greater than 3 per cent. Note, after all the tests have settled, the amount of undissolved matter which is left at the bottom, as this is one of the data upon which an idea of the value of the drier must be formed.

B.—Solution of Drier in Turpentine or Benzine.—For the preparation of these liquid siccatives 1 to 1.4 parts of the metallic resinate or linoleate are added to the benzine or turpentine and dissolved at a gentle heat, or the drier may first be melted over a fire and added to the solvent while in the liquid state. The proportion of matter which does not go into solution must be carefully noted as a factor in the valuation of the drier. From 5 to 10 per cent of the liquid siccative is now added to the linseed oil, and the mixture shaken well, at intervals during 24 hours.

Samples of all the oils prepared as above should be placed in small clear bottles, which are very narrow inside, so that a thin layer of the oil may be observed. The bottles are allowed to stand for 3 or 4 days in a temperate room, without being touched. When sufficient time has been allowed for thorough settling, the color, transparency, and consistency of the samples are carefully observed, and also the quantity and nature of any precipitate which may have settled out. A note should also be made of the date for future reference. Naturally the drier which has colored the oil least and left it most clean and thin, and which shows the smallest precipitate, is the most suitable for general use. The next important test is that of drying power, and is carried out as follows: A few drops of the sample are placed on a clear, clean glass plate, 4 x 6 inches, and rubbed evenly over with the fingers. The plate is then placed, clean side up, in a sloping position with the upper edge resting against a wall. In this way any excess of oil is run off and a very thin equal layer is obtained. It is best to start the test early in the morning as it can then be watched throughout the day. It should be remarked that the time from the "tacky" stage to complete dryness is usually very short, so that the observer must be constantly on the watch. If a good drier has been used, the time may be from 4 to 5 hours, and should not be more than 12 or at the very highest

15. The bleaching of the layer should also be noted. Many of the layers, even after they have become as dry as they seem capable of becoming, show a slight stickiness. These tests should be set aside in a dust-free place for about 8 days, and then tested with the finger.

SIGN LETTERS:

To Remove Black Letters from White Enameled Signs.—It frequently happens that a change has to be made on such signs, one name having to be taken off and another substituted. Priming with white lead followed by dull and glossy zinc white paint always looks like a daub and stands out like a pad. Lye, glass paper or steel chips will not attack the burned-in metallic enamel. The quickest plan is to grind down carefully with a good grindstone.

SIGN-LETTER CEMENTS:

See Adhesives, under Cements.

SIGNS, TO REPAIR ENAMELED:

See Enamels.

SILK:

Artificial "Rubbered" Silk.—A solution of caoutchouc or similar gum in acetone is added, in any desired proportion, to a solution of nitro-cellulose in acetone, and the mixture is made into threads by passing it into water or other suitable liquid. The resulting threads are stated to be very brilliant in appearance, extremely elastic, and very resistant to the atmosphere and to water. The product is not more inflammable than natural silk.

Artificial Ageing of Silk Fabrics.—To give silk goods the appearance of age, exposure to the sun is the simplest way, but as this requires time it cannot always be employed. A quicker method consists in preparing a dirty-greenish liquor of weak soap water, with addition of a little blacking and gamboge solution. Wash the silk fabric in this liquor and dry as usual, without rinsing in clean water, and calender.

Bleaching Silk.—The Lyons process of bleaching skeins of silk is to draw them rapidly through a sort of aqua regia bath. This bath is prepared by mixing 5 parts of hydrochloric acid with 1 of nitric, leaving the mixture for 4 or 5 days at a gentle heat of about 77° F., and then diluting with about 15 times its volume of water. This dilution is effected in large tanks cut from stone. The temperature of the bath should be from 68° to 85° F., and the skeins should not be in it over 15 minutes, and frequently not so long as that; they must be kept in motion during all that time. When taken out, the silk is immediately immersed successively in 2 troughs of water, to remove every trace of the acid, after which they are dried.

Hydrogen peroxide is used as a silk bleach, the silk being first thoroughly washed with an alkaline soap and ammonium carbonate to free it of its gummy matter. After repeated washings in the peroxide (preferably rendered alkaline with ammonia and soda), the silk is "blued" with a solution of blue aniline in alcohol.

Washing of Light Silk Goods.—The best soap may change delicate tints. The following method is therefore preferable: First wash the silk tissue in warm milk. Prepare a light bran infusion, which is to be decanted, and after resting for a time, passed over the fabric. It is then rinsed in this water, almost cold. It is moved about in all directions, and afterwards dried on a napkin.

SILK SENSITIZERS FOR PHOTOGRAPHIC PURPOSES:

See Photography, under Paper-Sensitizing Processes.

Silver

Antique Silver (see also Plating).—Coat the polished silver articles with a thin paste of powdered graphite, 6 parts; powdered bloodstone, 1 part; and oil of turpentine. After the drying take off the superfluous powder with a soft brush and rub the raised portions bright with a linen rag dipped in spirit. By treatment with various sulphides an old appearance is likewise imparted to silver. If, for example, a solution of 5 parts of liver of sulphur and 10 parts of ammonium carbonate are heated in 1 quart of distilled water to 180° F., placing the silver articles therein, the latter first turn pale gray, then dark gray, and finally assume a deep black-blue. In the case of plated ware, the silvering must not be too thin; in the case of thick silver plating or solid silver 1 quart of water is sufficient. The colors will then appear more quickly. If the coloring is spotted or otherwise imperfect dip the objects into a warm potassium cyanide solution, whereby the silver sulphide formed is immediately

dissolved. The bath must be renewed after a while. Silver containing much copper is subjected, previous to the coloring, to a blanching process, which is accomplished in a boiling solution of 15 parts of powdered tartar and 30 parts of cooking salt in 2 pints of water. Objects which are to be mat are coated with a paste of potash and water after the blanching, then dry, anneal, cool in water, and boil again.

Imitation of Antique Silver.—Plated articles may be colored to resemble old objects of art made of solid silver. For this purpose the deep-lying parts, those not exposed to friction, are provided with a blackish, earthy coating, the prominent parts retaining a leaden but bright color. The process is simple. A thin paste is made of finely powdered graphite and oil of turpentine (a little bloodstone or red ocher may be added, to imitate the copper tinge in articles of old silver) and spread over the whole of the previously plated article. It is then allowed to dry, and the particles not adhering to the surface removed with a soft brush. The black coating should then be carefully wiped off the exposed parts by means of a linen rag dipped in alcohol. This process is very effective in making imitations of objects of antique art, such as goblets, candlesticks, vessels of every description, statues, etc. If it is desired to restore the original brightness to the object, this can be done by washing with caustic soda or a solution of cyanide of potassium. Benzine can also be used for this purpose.

Blanching Silver.—I.—Mix powdered charcoal, 3 parts, and calcined borax, 1 part, and stir with water so as to make a homogeneous paste. Apply this paste on the pieces to be blanched. Put the pieces on a charcoal fire, taking care to cover them up well; when they have acquired a cherry red, withdraw them from the fire and leave to cool off. Next place them in a hot bath composed of 9 parts of water and 1 part of sulphuric acid, without causing the bath to boil. Leave the articles in for about 1 hour. Remove them, rinse in clean water, and dry.

II.—If the coat of tarnish on the surface of the silver is but light and superficial, it suffices to rub the piece well with green soap to wash it thoroughly in hot water; then dry it in hot sawdust and pass it through alcohol, finally rubbing with a fine cloth or brush. Should the coat resist this treatment, brush with Spanish white, then wash, dry, and pass through alcohol. The employment of Spanish white has the drawback of shining the silver if the application is strong and prolonged. If the oxidation has withstood these means and if it is desired to impart to the chain the handsome mat appearance of new goods, it should be annealed in charcoal dust and passed through vitriol, but this operation, for those unused to it, is very dangerous to the soldering and consequently may spoil the piece.

Coloring Silver.—A rich gold tint may be imparted to silver articles by plunging them into dilute sulphuric acid, saturated with iron rust.

Frosting Polished Silver.—Articles of polished silver may be frosted by putting them into a bath of nitric acid diluted with an equal volume of distilled water and letting them remain a few minutes. A better effect may be given by dipping the article frequently into the bath until the requisite degree of frosting has been attained. Then rinse and place for a few moments in a strong bath of potassium cyanide; remove and rinse. The fingers must not be allowed to touch the article during either process. It should be held with wooden forceps or clamps.

Fulminating Silver.—Dissolve 1 part of fine silver in 10 parts of nitric acid of 1.36 specific gravity at a moderate heat; pour the solution into 20 parts of spirit of wine (85 to 90 per cent) and heat the liquid. As soon as the mixture begins to boil, it is removed from the fire and left alone until cooled off. The fulminic silver crystallizes on cooling in very fine needles of dazzling whiteness, which are edulcorated with water and dried carefully in the air.

Hollow Silverware.—A good process for making hollow figures consists in covering models of the figures, made of a base or easily soluble metal, with a thin and uniform coating of a nobler metal, by means of the electric current in such a way that this coating takes approximately the shape of the model, the latter being then removed by dissolving it with acid. The model is cast from zinc in one or more pieces, a well-chased brass mold being used for this purpose, and the separate parts are then soldered together with an easily fusible solder. The figure is then covered with a galvanized coating of silver, copper, or other metal. Before receiving the coating of silver, the figure is first covered with a thin deposit of copper, the silver being added afterwards in the required thickness. But in order

that the deposit of silver may be of the same thickness throughout (this is essential if the figure is to keep the right shape), silver anodes, so constructed and arranged as to correspond as closely as possible to the outlines of the figure, should be suspended in the solution of silver and cyanide of potassium on both sides of the figure, and at equal distances from it. As soon as the deposit is sufficiently thick, the figure is removed from the bath, washed, and put into a bath of dilute sulphuric or hydrochloric acid, where it is allowed to remain till the zinc core is dissolved. The decomposition of the zinc can be accelerated by adding a pin of copper. The figure now requires only boiling in soda and potassic tartrate to acquire a white color. If the figure is to be made of copper, the zinc model must be covered first with a thin layer of silver, then with the copper coating, and then once more with a thin layer of silver, so that while the zinc is being dissolved, the copper may be protected on either side by the silver. Similar precautions must be taken with other metals, regard being paid to their peculiar properties. Another method is to cast the figures, entire or in separate parts, out of some easily fusible alloy in chased metal molds. The separate portions are soldered with the same solder, and the figure is then provided with a coating of copper, silver, etc., by means of the galvanic current. It is then placed in boiling water or steam, and the inner alloys melted by the introduction of the water or steam through holes bored for this purpose.

Lustrous Oxide on Silver (see also Plating and Silver, under Polishes).—Some experience is necessary to reproduce a handsome black luster. Into a cup filled with water throw a little liver of sulphur and mix well. Scratch the silver article as bright as possible with the scratch brush and dip into the warm liquid. Remove the object after 2 minutes and rinse off in water. Then scratch it up again and return it into the liquid. The process should be repeated 2 or 3 times, whereby a wonderful glossy black is obtained.

Ornamental Designs on Silver.—Select a smooth part of the silver, and sketch on it a monogram or any other design with a sharp lead pencil. Place the article in a gold solution, with the battery in good working order, and in a short time all the parts not sketched with the lead pencil will be covered with a coat of gold. After cleaning the article the black lead is easily removed with the finger, whereupon the silver ornament is disclosed. A gold ornament may be produced by reversing the process.

Separating Silver from Platinum Waste.—Cut the waste into small pieces, make red hot to destroy grease and organic substances, and dissolve in aqua regia (hydrochloric acid, 3 parts, and nitric acid, 1 part). Platinum and all other metals combined with it are thus dissolved, while silver settles on the bottom as chloride in the shape of a gray, spongy powder. The solution is then drawn off and tested by oxalic acid for gold, which is precipitated as a fine yellowish powder. The other metals remain untouched thereby. The platinum still present in the solution is now obtained by a gradual addition of sal ammoniac as a yellowish-gray powder. These different precipitates are washed with warm water, dried, and transformed into the metallic state by suitable fluxes. Platinum filings, however, have to be previously refined. They are also first annealed. All steel or iron filings are removed with a magnet and the rest is dipped into concentrated sulphuric acid and heated with this to the boiling point. This process is continued as long as an action of the acid is noticeable. The remaining powder is pure platinum. Hot sulphuric acid dissolves silver without touching the platinum. The liquid used for the separation of the platinum is now diluted with an equal quantity of water and the silver expelled from it by means of a saturated cooking salt solution. The latter is added gradually until no more action, i. e., separation, is perceptible. The liquid is carefully drawn off, the residue washed in warm water, dried and melted with a little soda ashes as flux, which yields pure metallic silver.

The old process for separating silver from waste was as follows: The refuse was mixed with an equal quantity of charcoal, placed in a crucible, and subjected to a bright-red heat, and in a short time a silver button formed at the bottom. Carbonate of soda is another good flux.

Silvering Glass Globes.—Take ⅓ ounce of clean lead, and melt it with an equal weight of pure tin; then immediately add ½ ounce of bismuth, and carefully skim off the dross; remove the alloy from the fire and before it grows cold add 5 ounces of mercury, and stir the whole well together; then put the fluid amalgam into a clean glass, and it is fit for use. When this amalgam is used for silvering

let it be first strained through a linen rag; then gently pour some ounces thereof into the globe intended to be silvered; the alloy should be poured into the globe by means of a paper or glass funnel reaching almost to the bottom of the globe, to prevent it splashing the sides; the globe should be turned every way very slowly, to fasten the silvering.

Silvering Powder for Metals.—Copper, brass, and some other metals may be silvered by rubbing well with the following powder: Potassium cyanide, 12 parts; silver nitrate, 6 parts; calcium carbonate, 30 parts. Mix and keep in a well-closed bottle. It must be applied with hard rubbing, the bright surface being afterwards rinsed with water, dried, and polished. Great care must be exercised in the use of the powder on account of its poisonous nature. It should not be allowed to come in contact with the hands.

Silver Testing.—For this purpose a cold saturated solution of potassium bichromate in pure nitric acid of 1.2 specific gravity is employed. After the article to be tested has been treated with spirit of wine for the removal of any varnish coating which might be present, a drop of the above test liquor is applied by means of a glass rod and the resultant spot rubbed off with a little water.

A testing solution of potassium bichromate, 1 ounce, pure nitric acid, 6 ounces, and water, 2 ounces, gives the following results on surfaces of the metals named:

Metal.	Color in one minute.	Color of mark left.
Pure silver	Bright blood-red	Grayish white
.925 silver	Dark red	Dark brown
.800 silver	Chocolate	Dark brown
.500 silver	Green	Dark brown
German silver	Dark blue	Light gray
Nickel	Turquoise blue	Scarcely any
Copper	Very dark blue	Cleaned copper
Brass	Dark brown	Light brown
Lead	Nut brown	Leaden
Tin	Reddish brown	Dark
Zinc	Light chocolate	Steel gray
Aluminum	Yellow	No stain
Platinum	Vandyke brown	No stain
Iron	Various	Black
9-carat gold	Unchanged	No stain

The second column in the table shows such change of color as the liquid—not the metal—undergoes during its action for the period of 1 minute. The test liquid being then washed off with cold water, the third column shows the nature of the stain that is left.

In the case of faintly silvered goods, such as buttons, this test fails, since the slight quantity of resulting silver chromate does not become visible or dissolves in the nitric acid present. But even such a thin coat of silver can be recognized with the above test liquor, if the bichromate solution is used, diluted with the equal volume of water, or if a small drop of water is first put on the article and afterwards a little drop of the undiluted solution is applied by means of a capillary tube. In this manner a distinct red spot was obtained in the case of very slight silvering.

A simpler method is as follows: Rub the piece to be tested on the touchstone and moisten the mark with nitric acid, whereupon it disappears. Add a little hydrochloric acid with a glass rod. If a white turbidness (silver chloride) appears which does not vanish upon addition of water, or, in case of faint silvering or an alloy poor in silver, a weak opalescence, the presence of silver is certain. Even alloys containing very little silver give this reaction quite distinctly.

Pink Color on Silver.—To produce a beautiful pink color upon silver, dip the clean article for a few seconds into a hot and strong solution of cupric chloride, swill it in water and then dry it or dip it into spirit of wine and ignite the spirit.

SILVER PLATING POWDER:

This is intended for use on brass and copper articles.

Chloride of silver	1	ounce
Pearlash	3	ounces
Common salt	1½	ounces
Whiting	1	ounce

These ingredients should be in as fine a powder as is possible to reduce them and thoroughly mixed together.

The article to be silvered should be thoroughly cleaned and wiped dry. Then with a soft piece of leather, that has been dampened in water and dipped in the powder thoroughly rub the article to be plated so that every section receives an even coat. It should then be washed well in hot water and wiped dry.

SILVER-PLATING:
See Plating.

SILVER, RECOVERY OF PHOTOGRAPHIC:
See Photography.

SILVER SOLDERS:
See Solders.

SKIN BLEACH FOR NEGROES:

Black Skin Whitner.—

I.—Yellow Wax ....8 ounces
Vaseline ....8 ounces
Cocoa Butter ....2 ounces

Melt all together in a double boiler. Take off the fire and add a solution of 10 grains of Corrosive suplimate in one ounce of alcohol and pour into jars while warm. This may be used before retiring. First wash the face, neck and arms with a good soap and hot water. Rince well and dry; then apply the cream. In the morning wash off and apply a good powder. Do this at least every other day.

II.—Paraffin Wax ....6 ounces
White Petrolatum ....1 pound
2% Solution Bichloride of mercury ....1 pound

Melt the waxes, take off the fire and add the heated solution, a little at a time, stirring well until cold. Wash the face well and after drying apply the cream. Use before retiring.

SKIN OINTMENTS:

See Ointments.

SKIN FOODS:

See Cosmetics.

SKIN TROUBLES:

See Soap.

SLATE:

Artificial Slate.—The artificial slate coating on tin consists of a mixture of finely ground slate, lampblack, and a water-glass solution of equal parts of potash and soda water glass (1.25 specific gravity). The process is as follows:

I.—First prepare the water-glass solution by finely crushing equal parts of solid potash and soda water glass and pouring over this 6 to 8 times the quantity of soft river water, which is kept boiling about 1½ hours, whereby the water glass is completely dissolved. Add 7 parts finely crushed slate finely ground with a little water into impalpable dust, 1 part lampblack, which is ground with it, and grind enough of this mass with the previously prepared water-glass solution as is necessary for a thick or thin coating. With this compound the roughened tin plates are painted as uniformly as possible. For roofing, zinc plate may be colored in the same manner. The coating protects the zinc from oxidation and consequently from destruction. For painting zinc plate, however, only pure potash water glass must be added to the mixture, as the paint would loosen or peel off from the zinc if soda water glass were used.

II.—Good heavy paper or other substance is saturated with linseed-oil varnish and then painted, several coats, one after another with the following mixture:

Copal varnish. ...	1 part
Oil of turpentine.....	2 parts
Fine, dry sand, powdered............	1 part
Powdered glass......	1 part
Ground slate........	2 parts
Lampblack..........	1 part

SLIDES FOR LANTERNS:

See Photography.

SLIDES, MICROSCOPICAL, TO CLEAN:

The slides may be boiled in nitric acid and alcohol or allowed to stand for several hours in a solution of bichromate of potash and sulphuric acid. After careful rinsing, they are ready for use.

SNAKE BITES.

About 25 years ago, Dr. S. Weir Mitchell and Dr. Reichert published results of their investigations of snake venom which indicated that permanganate of potassium may prove of material value as an antidote to this lethal substance. Since that time permanganate has been largely used all over the world as a remedy when men and animals were bitten by poisonous snakes, and Sir Lauder Brunton devised an instrument by means of which the permanganate may be readily carried in the pocket, and immediately injected into, or into the neighborhood of, the wound. Captain Rodgers, of the Indian Medical Service, recently reported several cases treated by this method, the wounds being due to the bites of the cobra. After making free crucial incisions of the bitten part, the wound was thoroughly flushed with a hot solution of permanganate of potassium, and then bandaged. Recovery occurred in each instance, although the cauterant action of the hot solution of permanganate of potassium delayed healing so long that the part was not well for about 3 weeks. About 12 or 13 years ago, Dr. Amos Barber, of Cheyenne, Wyoming, reported cases in which excellent results had followed this method of treatment.

Soaps

(See also Cleaning Compounds and Polishes.)

ANTISEPTIC SOAP.

I.—Various attempts have been made to incorporate antiseptics and cosmetics with soap, but for the most part unsuccessfully, owing to the unfavorable action of the added components, a good instance of this kind being sodium peroxide, which, though a powerful antiseptic, soon decomposes in the soap and loses its properties, while the caustic character of the oxide renders its use precarious, even when the soap is fresh, unless great care is taken. However, according to a German patent, zinc peroxide is free from these defects, since it retains its stability and has no corrosive action on the skin, while possessing powerful antiseptic and cosmetic properties, and has a direct curative influence when applied to cuts or wounds.

II.—The soap is prepared by melting 80 parts of household soap in a jacketed pan, and gradually adding 20 parts of moist zinc peroxide (50 per cent strength), the whole being kept well stirred all the time. The finished mixture will be about as stiff as dough, and is easily shaped into tablets of convenient size.

III.—Take 50 parts, by weight, of caustic soda of 70 per cent, and free from carbonic acid, if possible; 200 parts, by weight, of sweet almond oil; 160 parts, by weight, of glycerine of 30° Bé.; and sufficient distilled water to make up 1,000 parts by weight. First, dissolve the alkali in double its weight of water, then add the glycerine and oil and stir together. Afterwards, add the remainder of the water and keep the whole on the water bath at a temperature of 140° to 158° F., for 24 to 36 hours; remove the oil not saponified, which gives a gelatinous mass. Mix 900 parts, by weight, of it with 70 parts, by weight, of 90 per cent alcohol and 10 parts, by weight, of lemon oil, and as much of the oil of bergamot and the oil of vervain. Heat for some hours at 140° F., then allow to cool and filter on wadding to eliminate the needles of stearate of potash. The liquid after filtering remains clear.

Carpet Soap.—

Fuller's earth........	4 ounces
Spirits of turpentine..	1 ounce
Pearlash...........	8 ounces

Rub smooth and make into a stiff paste with a sufficiency of soft soap.

To Cut Castile Soap.—A thin spatula must be used. To cut straight, a trough with open ends made with $\frac{1}{2}$-inch boards should be taken, the inside dimensions being $2\frac{3}{8}$ inches wide, $3\frac{3}{4}$ inches deep, and about 14 inches long. Near the end a perpendicular slit is sawed through the side pieces. Passing the spatula down through this slit the bar is cut neatly and straight. For trimming off the corners a carpenter's small iron plane works well.

COLORING SOAP.

The first point to be observed is to select the proper shade of flower corresponding with the perfume used, for instance, an almond soap is left white; rose soap is colored pink or red; mignonette, green, etc.

The colors from which the soapmaker may select are numerous; not only are most of the coal-tar colors adapted for his purpose, but also a very great number of mineral colors. Until recently, the latter were almost exclusively employed, but the great advance in the tar-color industry has brought about a change. A prominent advantage of the mineral colors is their stability; they are not changed or in any way affected by exposure to light. This advantage, however, is offset in many cases by the more difficult method of application, the difficulty of getting uniform shades. The coal-tar colors give brilliant shades and tints, are easy to use, and produce uniform tints. The specific gravity of mineral colors being rather high, in most cases they will naturally tend to settle toward the bottom of soap, and their use necessitates crutching of the soap until it is too thick to allow the color to settle. For mottled soap, however, vermilion, red oxide, and ultramarine are still largely employed.

For transparent soap mineral colors are not applicable, as they would detract from their transparency; for milled toilet soap, on the other hand, they are very well adapted, as also for cold-made soaps which require crutching anyway until a sufficient consistency is obtained to keep the coloring material suspended.

A notable disadvantage in the use of aniline colors, besides their sensitiveness to the action of light, is the fact that many of them are affected and partly destroyed by the action of alkali. A few of them are proof against a small excess of lye, and these may be used with good effect. Certain firms have made a specialty of manufacturing colors answering the peculiar requirements of soap, being very easy of

application, as they are simply dissolved in boiling water and the solution stirred into the soap. To some colors a little weak lye is added; others are mixed with a little oil before they are added to the soap.

For a soluble red color there were formerly used alkanet and cochineal; at present these have been displaced to a great extent, on account of their high cost, by magenta, which is very cheap and of remarkable beauty. A very small amount suffices for an intense color, nor is a large proportion desirable, as the soap would then stain. Delicate tints are also produced by the eosine colors, of which rose bengal, phloxine, rhodamine, and eosine are most commonly used. These colors, when dissolved, have a brilliant fluorescence which heightens their beautiful effect.

The following minerals, after being ground and washed several times in boiling water, will produce the colors stated:

Hematite produces deep red.
Purple oxide iron produces purple.
Oxide of manganese produces brown.
Yellow ocher produces yellow.
Yellow ocher calcined produces orange.
Umber produces fawn.
Cinnabar produces medium red.

There are also a number of the azo dyes, which are suitable for soaps, and these, as well as the eosine colors, are used principally for transparent soaps. For opaque soaps both aniline and mineral reds are used, among the latter being vermilion, chrome red, and iron oxide. Chrome red is a basic chromate of lead, which is now much used in place of vermilion, but, as it becomes black on exposure to an atmosphere containing even traces only of sulphureted hydrogen, it is not essentially adapted for soap. Vermilion gives a bright color, but its price is high. Iron oxide, known in the trade as colcothar, rouge, etc., is used for cheap soaps only.

Among the natural colors for yellow are saffron, gamboge, turmeric, and caramel (sugar color); the first named of these is now hardly used, owing to its high cost. Of the yellow aniline colors special mention must be made of picric acid (trinitrophenol), martius yellow, naphthol yellow, acid yellow, and auramine. If an orange tint is wanted, a trace of magenta or safranine may be added to the yellow colors named. The use of some unbleached palm oil with the stock answers a similar purpose, but the color fades on exposure. A mineral yellow is chrome yellow (chromate of lead), which has the same advantages and disadvantages as chrome red.

Of the blue aniline colors, there may be used alkali blue, patent blue, and indigo extract. Alkali or aniline blue is soluble only in alkaline liquids; while patent blue is soluble in water and in alcohol. Both blues can be had in different brands, producing from green blues to violet blues. Indigo extract, which should be classed among the natural colors rather than among the tar colors, is added to the soap in aqueous solution.

Of ultramarine there are two modifications, the sulphate and the soda. Both of these are proof against the action of alkali, but are decomposed by acids or salts having an acid reaction. The former is much paler than the latter; the soda ultramarine is best adapted for coloring soda soaps blue. The ultramarine is added to the soap in the form of a fine powder. Smalt is unsuitable, although it gives soap a color of wonderful beauty because a considerable quantity of it is required to produce a deep color, and, furthermore, it makes the soap rough, owing to the gritty nature which smalt has even when in the finest powder. By mixing the blue and yellow colors named, a great variety of greens are obtained. Both component colors must be entirely free from any reddish tint, for the latter would cause the mixture to form a dirty-green color.

Of the colors producing green directly the two tar colors, Victoria and brilliant green, are to be noted; these give a bright color, but fade rapidly; thereby the soap acquires an unsightly appearance. For opaque soap of the better grades, green ultramarine or chrome green are used. Gray and black are produced by lampblack. For brown, there is Bismarck brown among the aniline colors and umber among the earthy pigments.

Garment-Cleaning Soap.—The following is excellent:

I.—White soap, rasped or shaved........ 12 parts
Ammonia water.... 3 parts
Boiling water...... 18 parts

Dissolve the soap in the water and when it cools down somewhat, add to the solution the ammonia water. Pour the solution into a flask of sufficient capacity (or holding about three times as much as the mixture) and add enough water to fill it about three-quarters full. Shake and add, a little at a time, under active agitation, enough benzine to make 100 parts. This constitutes the stock

bottle. To make up the mass or paste put a teaspoonful in an 8-ounce bottle and add, a little at a time, with constant agitation, benzine to about fill the bottle. This preparation is a rapid cleaner and does not injure the most delicate colors.

II.—Good bar soap, shaved up.....	165 parts
Ammonia water..	45 parts
Benzine........	190 parts
Water sufficient to make.......	1,000 parts

Dissolve the soap in 600 parts of water by heating on the water bath, remove, and add the ammonia under constant stirring. Finally add the benzine, and stir until homogeneous, and quite cold. The directions to go with this paste are: Rub the soap well into the spot and lay the garment aside for a half hour. Then using a stiff brush, rub with warm water and rinse. This is especially useful in spots made by rosins, oils, grease, etc. Should the spot be only partially removed by the first application, repeat.

Glycerine Soaps.—Dr. Sarg's liquid glycerine soap consists of 334 parts of potash soda soap, and 666 parts of glycerine free from lime, the mixture being scented with Turkish rose oil and orange blossom oil in equal proportions, the actual amount used being varied according to taste. The soap should be perfectly free from alkali; but as this is a condition difficult of attainment in the case of ordinary potash soaps, it is presupposed that the soap used has been salted out with potassium chloride, this being the only way to obtain a soap free from alkali.

Another variety of liquid glycerine soap is prepared from purified medicinal soft soap, 300 parts; glycerine free from lime, 300 parts; white sugar syrup, 300 parts; doubly rectified spirit (96 per cent), 300 parts. The mixture is scented with oil of cinnamon, 1 part; oil of sassafras, 2 parts; oil of citronella, ½ part; oil of wintergreen, 1 part; African geranium oil, 1 part; clove oil, ½ part; oil of bergamot, 3 parts; pure tincture of musk, ½ part. These oils are dissolved in spirit, and shaken up with the other ingredients; then left for 8 days with frequent shaking, and 3 days in absolute quiet, after which the whole is filtered, and is then ready for packing.

Iodine Soaps.—In British hospitals, preference is given to oleic acid over alcoholic preparations for iodine soaps, as the former do not stain and can be washed off with soap and water. The following formula is given:

I.—Iodine..........	1 av. ounce
Oleic acid.......	1 fluidounce
Alcohol..........	6 fluidrachms
Stronger water of ammonia......	2 fluidrachms

This makes a soapy paste soluble in all liquids, except fixed oils.

II.—Iodine..........	1 av. ounce
Oleic acid.......	2 fluidounces
Stronger water of ammonia......	3 fluidrachms
Paraffine oil, colorless, to make	20 fluidounces

III.—Iodine..........	1 av. ounce
Alcohol.........	5 fluidounces
Solution of ammonium oleate.	1 fluidounce
Glycerine to make	20 fluidounces

The solution of ammonium oleate is made from oleic acid and spirit of ammonia.

Liquid Soaps.—Liquid soaps, or, as they are sometimes called, soap essences, are made from pure olive-oil soap by dissolving it in alcohol and adding some potassium carbonate. Tallow or lard soaps cannot be used, as they will not make a transparent preparation. The soap is finely shaved and placed with the alcohol and potassium carbonate in a vessel over a water bath, the temperature slowly and gradually raised, while the mixture is kept in constant agitation by stirring. The soap should be of a pure white color and the alcohol gives the best product when it is about 80 per cent strength. After about three-quarters of an hour to one hour, solution will be complete and a perfectly transparent article obtained. This can be scented as desired by adding the proper essential oil as soon as the mixture is removed from the water bath.

If an antiseptic soap is wanted the addition of a small amount of benzoic acid, formaldehyde, or corrosive sublimate will give the desired product. Liquid soaps should contain from 20 to 40 per cent of genuine white castile soap and about 2 to 2¼ per cent of potassium carbonate.

This is a common formula:

	By weight
I.—Olive or cottonseed oil............	60 parts
Caustic potash, U. S. P............	15 parts
Alcohol and water, sufficient of each.	

Dissolve the potash in 1 ounce of water, heat the oil on a water bath, add the solution of potash previously warmed, and stir briskly. Continue the heat until saponification is complete. If oil globules separate out and refuse to saponify, the potash is not of proper strength, and more must be added—1 or 2 parts dissolved in water. If desired transparent add a little alcohol, and continue the heat without stirring until a drop placed in cold water first solidifies and then dissolves.

Commercial potash may be used, but the strength must be ascertained and adjusted by experiment. The soap thus made will be like jelly; it is dissolved in alcohol, 4 to 6 ounces of soap to 2 of alcohol, and after standing a day or two is filtered and perfumed as desired. A rancid oil would be easier to saponify, but the soap would likely be rancid or not as good.

II.—Ammonium sulphoichthyolate, 10 parts; distilled water, 15 parts; hebra's soap spirit (a solution of potash soap, 120 parts, in 90 per cent spirit, 60 parts; and spirit of lavender, 5 parts), 75 parts.

MEDICATED SOAPS.

First make up a suitable soap body and afterwards add the medicament. For instance, carbolic soaps may be made as follows:

I.—Cocoanut oil	20 pounds
Tallow	4 pounds
Soda lye (38° to 40° B.)	12 pounds
Phenol	1 pound

Prepare the body soap by stirring the liquefied fat into the lye at 113° F., and when combination has set in, incorporate the phenol and quickly pour into molds. Cover the latter well. Instead of the phenol 2 pounds of sulphur may be used, and a sulphur soap made.

	Parts by weight
II.—Cotton oil	200
Alcohol, 91 per cent	300
Water	325
Caustic soda	45
Potassium carbonate	10
Ether	15
Carbolic acid	25

The oil is mixed in a large bottle with water, 100 parts; alcohol, 200 parts; and caustic soda, 45 parts, and after saponification the remaining alcohol and the potassium carbonate dissolved in the rest of the water, and finally the carbolic acid and the ether are added and the whole well shaken. The mixture is filled in tightly closed bottles and stored at medium temperature. The preparation may be scented as desired, and the carbolic acid replaced with other antiseptics.

Liquid Tar Soap.—Mix 200 parts of tar with 400 parts of oleic acid, warm lightly and filter. In this way the aqueous content produces no trouble. Now warm the filtrate on the water bath, neutralize by stirring in an alcoholic potash solution. To the soap thus produced, add 100 parts of alcohol, and further a little olive oil, in order to avoid a separation of any overplus of alkaline matter. Finally, bring up to 1,000 parts with glycerine. This soap, containing 22 per cent of tar, answers all possible demands that may be made upon it. Mixed with 2 parts of distilled water it leaves no deposit on the walls of the container.

Liquid Styrax Soap.—The process is identical with the foregoing. For digestion with oleic acid, the crude balsam will answer, since filtration deprives the product of all contaminating substances. While this soap will separate, it is easily again rendered homogeneous with a vigorous shake. Preparations made with it should be accompanied with a "shake" label.

Superfatted Liquid Lanolin-Glycerine Soap.—Dissolve about 10 per cent of lanolin in oleic acid, saponify as in the tar soap, and perfume (for which a solution of coumarin in geranium oil is probably the most suitable agent). The prepared soap is improved by the addition of a little tincture of benzoin.

Massage Soaps.—I.—An excellent recipe for a massage soap is: Special cocoanut oil ground soap, 2,500 pounds; lanolin, 50 pounds; pine-needle oil, 20 pounds; spike oil, 3 pounds. Other massage soaps are made from olive oil ground soap, to which in special cases, as in the treatment of certain rheumatic affections, ichthyol is added. Massage soaps are always wanted white, so that Cochin cocoanut oil should be preferred to other kinds.

II.—Cocoanut oil, 1,000 pounds; caustic soda lye, 37° B., 500 pounds; pine-needle oil, 4 pounds; artificial bitter almond oil, 2 pounds. There is also a "massage cream," which differs from the ordinary massage soaps in being made with a soft potash soap as a ground soap. The oils, etc., incorporated with the ground mass are exactly the same in the "cream" as in the soap.

Metallic Soaps.—Metallic soaps are obtained by means of double decomposition. First a soap solution is produced which is brought to a boil. On the other hand, an equally strong solution of the metallic salt of which the combination is to be made (chlorides and sulphides are employed with preference) is prepared, the boiling solutions are mixed together, and the metallic soap obtained is gathered on a linen cloth. This is then put on enameled plates and dried, first at 104° F., later at 140° F.

Aluminum soap is the most important. Dissolved in benzine or oil of turpentine, it furnishes an excellent varnish. It has been proposed to use these solutions for the varnishing of leather; they furthermore serve for the production of waterproof linen and cloths, paper, etc. Jarry recommended this compound for impregnating railroad ties to render them weatherproof.

Manganese soap is used as a siccative in the preparation of linseed-oil varnish, as well as for a drier to be added to paints. Zinc soap is used in the same manner.

Copper soap enters into the composition of gilding wax, and is also employed for bronzing plaster of Paris articles. For the same purpose, a mixture is made use of consisting of copper soap and iron soap melted in white lead varnish and wax. Iron soap is used with aluminum soap for waterproofing purposes and for the production of a waterproof varnish. By using wax instead of a soap, insoluble metallic soaps are obtained, which, melted in oils or wax, impart brilliant colorings to them; but colored waterproof and weather-resisting varnishes may also be produced with them. Metallic rosin soaps may be produced by double decomposition of potash rosin soaps and a soluble metal salt. From these, good varnishes are obtained to render paper carriage covers, etc., waterproof; they may also be employed for floor wax or lacquers.

Petroleum Soap.—

I.—	Beeswax, refined	4 parts
	Alcohol	5 parts
	Castile soap, finely grated	10 parts
	Petroleum	5 parts

Put the petroleum into a suitable vessel along with the wax and alcohol and cautiously heat on the water bath, with an occasional agitation, until complete solution is effected. Add the soap and continue the heat until it is dissolved. When this occurs remove from the bath and stir until the soap begins to set, then pour into molds.

II.—The hydrocarbons (as petroleum, vaseline, etc.) are boiled with a sufficient quantity of alkali to form a soap, during which process they absorb oxygen and unite with the alkali to form fatty acid salts. The resulting soap is dissolved in water containing alkali, and the solution is heated along with alkali and salt. The mass of soap separates out in three layers, the central one being the purest; and from this product the fatty acids may be recovered by treatment with sulphuric acid.

Perfumes for Soap.—From 1 to 2 ounces of the following mixtures are to be used to 10 pounds of soap:

I.—	Oil of rose geranium	2	ounces
	Oil of patchouli	½	ounce
	Oil of cloves	½	ounce
	Oil of lavender flowers	1	ounce
	Oil of bergamot	1	ounce
	Oil of sandalwood	1	ounce
II.—	Oil of bergamot	2	ounces
	Oil of orange flowers	2	ounces
	Oil of sassafras	2	ounces
	Oil of white thyme	3	ounces
	Oil of cassia	3	ounces
	Oil of cloves	3	ounces
III.—	Oil of citronella	1	ounce
	Oil of cloves	1	ounce
	Oil of bitter almonds	2	ounces

Pumice-Stone Soaps.—These soaps are always produced by the cold process, either from cocoanut oil alone or in conjunction with tallow, cotton oil, bleached palm oil, etc. The oil is melted and the lye stirred in at about 90° F.; next, the powdered pumice stone is sifted into the soap and the latter is scented. Following are some recipes:

I.—	Cocoanut oil	40,000 parts
	Cotton oil	10 000 parts
	Caustic soda lye, 38° Bé	24,000 parts
	Caustic potash lye, 30° Bé	1,000 parts
	Powdered pumice stone	25,000 parts
	Cassia oil	150 parts
	Rosemary oil	100 parts
	Lavender oil	50 parts
	Safrol	50 parts
	Clove oil	10 parts
II.—	Cocoanut oil	50,000 parts
	Caustic soda lye, 40° Bé	25,000 parts

Powdered pumice stone	50,000 parts
Lavender oil	250 parts
Caraway oil	80 parts

Shaving Soaps.

I.—Palm oil soap	5 pounds
Oil of cinnamon	10 drachms
Oil of caraway	2 drachms
Oil of lavender	2 drachms
Oil of thyme	1 drachm
Oil of peppermint	45 minims
Oil of bergamot	2½ drachms

Melt the soap, color if desired, and incorporate the oils.

II.—Soap	10 pounds
Alcohol	1 ounce
Oil of bitter almonds	1¼ ounces
Oil of bergamot	¾ ounce
Oil of mace	3 drachms
Oil of cloves	½ ounce

Melt the soap with just enough water to convert it into a soft paste when cold; dissolve the oils in the alcohol, mix with the paste, and rub up in a mortar, or pass several times through a kneading machine.

III.—White castile soap	5 parts
Alcohol	15 parts
Rose water	15 parts

SOAP POWDERS.

The raw materials of which soap powder is made are soap and soda, to which ingredients an addition of talcum or water glass can be made, if desired, these materials proving very useful as a filling. An excellent soap powder has been made of 20 parts of crystallized soda, 5 parts of dark-yellow soap (rosin curd), and 1 part of ordinary soft soap. At first the two last mentioned are placed in a pan, then half the required quantity of soda is added, and the whole is treated. Here it must be mentioned that the dark-yellow curd soap, which is very rosinous, has to be cut in small pieces before placing the quantity into the pan. The heating process must continue very slowly, and the material has to be crutched continually until the whole of the substance has been thoroughly melted. Care must be taken that the heating process does not reach the boiling point. The fire underneath the pan must now be extinguished, and then the remaining half of the crystallized soda is added to be crutched with the molten ingredients, until the whole substance has become liquid. The liquefaction is assisted by the residual heat of the first heated material and the pan. The slow cooling facilitates the productive process by thickening the mass, and when the soda has been absorbed, the whole has become fairly thick. With occasional stirring of the thickened liquid the mass is left for a little while longer, and when the proper moment has arrived the material contained in the pan is spread on sheets of thin iron, and these are removed to a cool room, where, after the first cooling, they must be turned over by means of a shovel, and the turning process has to be repeated at short intervals until the material has quite cooled down and the mixture is thoroughly broken. The soap is now in a very friable condition, and the time has now come to make it into powder, for which purpose it is rubbed through the wire netting or the perforated sieves. Generally the soap is first rubbed through a coarse sieve, and then through finer ones, until it has reached the required conditions of the powder. Some of the best soap powders are coarse, but other manufacturers making an equally good article prefer the finer powder, which requires a little more work, since it has to go through three sieves, whereas the coarse powder can do with one or at most two treatments. But this is, after all, a matter of local requirements or personal taste.

The powder obtained from the above-mentioned ingredients is fine and yellow colored, and it has all the qualities needed for a good sale. Instead of the dark-yellow soap, white stock soap can also be used, and this makes only a little difference in the coloring. But again white stock soap can be used, and the same color obtained by the use of palm oil, or other coloring ingredients, as these materials are used for giving the toilet soaps their manifold different hues. Many makers state that this process is too expensive, and not only swallows up all the profit, but some of the color materials influence the soap and not to its advantage.

Soft soap is used only to make the powder softer and easier soluble, and for this reason the quantity to be used varies a little and different manufacturers believe to have a secret by adding different quantities of this material. As a general statement it may be given that the quantity of soft soap for the making of soap powder should not overstep the proportion of one to three, compared with the quantity of hard soap; any excess in this direction would frustrate the desires of the maker, and land him with a product which has become smeary and moist, forming into balls and lumping together

in bags or cases, to become discolored and useless. It is best to stick to the proportion as given, 5 parts of hard and 1 part of soft soap, when the produced powder will be reliable and stable and not form into balls even if the material is kept for a long while.

This point is of special importance, since soap powder is sold mostly in weighed-out packages of one and a half pounds. Most manufacturers will admit that loose soap powder forms only a small part of the quantities produced, as only big laundries and institutions purchase same in bags or cases. The retail trade requires the soap powder wrapped up in paper, and if this has to be done the powder must not be too moist, as the paper otherwise will fall to pieces. This spoils the appearance of the package, and likely a part of the quantity may be lost. When the powder is too moist or absorbs easily external moisture, the paper packages swell very easily and burst open.

The best filling material to be employed when it is desired to produce a cheaper article is talcum, and in most cases this is preferred to water glass. The superiority of the former over the latter is that water glass hardens the powder, and this is sometimes done to such an extent, when a large quantity of filling material is needed, that it becomes very difficult to rub the soap through the sieves. In case this difficulty arises, only one thing can be done to lighten the task, and that is to powderize the soap when the mixed materials are still warm, and this facilitates the work very much. It is self-evident that friction under these conditions leaves a quantity of the soap powder material on the sieves, and this cannot be lost. Generally it is scraped together and returned to the pan to be included in the next batch, when it is worked up, and so becomes useful, a need which does not arise when talcum has been used as a filling material. Again, the soap powder made with the addition of water glass is not so soluble, and at the same time much denser than when the preparation has been made without this material. It is thus that the purchaser receives by equal weight a smaller-looking quantity, and as the eye has generally a great influence when the consumer determines a purchase, the small-sized parcels will impress him unfavorably. This second quality of soap powder is made of the same ingredients as the other, except that an addition of about 6 parts of talcum is made, and this is stirred up with the other material after all the soda has been dissolved. Some makers cheapen the products also by reducing the quantity of hard soap from 5 to 3 parts and they avoid the filling; the same quantity of soda is used in all cases. On the same principle a better quality is made by altering the proportions of soda and soap the other way. Experiments will soon show which proportions are most suitable for the purpose.

So-called ammonia-turpentine soap powder has been made by crutching oil of turpentine and ammonia with the materials just about the time before the whole is taken out of the heating pan. Some of the powder is also scented, and the perfume is added at the same time and not before. In most of the latter cases mirbane oil is used for the purpose.

These powders are adaptable to hard water, as their excess of alkali neutralizes the lime that they contain:

I.—Curd (hard) soap, powdered	4 parts
Sal soda	3 parts
Silicate of soda	2 parts

Make as dry as possible, and mix intimately.

Borax Soap Powder.—

II.—Curd (hard) soap, in powder	5 parts
Soda ash	3 parts
Silicate of soda	2 parts
Borax (crude)	1 part

Each ingredient is thoroughly dried, and all mixed together by sieving.

London Soap Powder.—

III.—Yellow soap	6 parts
Soda crystals	3 parts
Pearl ash	1½ parts
Sulphate of soda	1½ parts
Palm oil	1 part

TOILET SOAPS.

The question as to the qualities of toilet soaps has a high therapeutical significance. Impurity of complexion and morbid anomalies of the skin are produced by the use of poor and unsuitable soaps. The latter, chemically regarded, are salts of fatty acids, and are prepared from fats and a lye, the two substances being mixed in a vessel and brought to a boil, soda lye being used in the preparation of toilet soaps. In boiling together a fat and a lye, the former is resolved into its component parts, a fatty acid and glycerine. The

acid unites with the soda lye, forming a salt, which is regarded as soap. By the addition of sodium chloride, this (the soap) is separated and swims on the residual liquid as "kern," or granulated soap. Good soaps were formerly made only from animal fats, but some of the vegetable oils or fats have been found to also make excellent soap. Among them the best is cacao butter.

From a hygienic standpoint it must be accepted as a law that a good toilet soap must contain no free (uncombined) alkali, every particle of it must be chemically bound up with fatty acid to the condition of a salt, and the resultant soap should be neutral in reaction. Many of the soaps found in commerce to-day contain free alkali, and exert a harmful effect upon the skin of those who use them. Such soaps may readily be detected by bringing them into contact with the tongue. If free alkali be present it will make itself known by causing a burning sensation—something that a good toilet soap should never do.

The efficiency of soap depends upon the fact that in the presence of an abundance of water the saponified fat is decomposed into acid and basic salts, in which the impurities of the skin are dissolved and are washed away by the further application of water. Good soap exerts its effects on the outer layer of the skin, the so-called horny (epithelial) layer, which in soapy water swells up and is, in fact, partially dissolved in the medium and washed away. This fact, however, is unimportant, since the superficial skin cells are reproduced with extraordinary rapidity and ease. When a soap contains or carries free alkali, the caustic effects of the latter are carried further and deeper, reaching below the epithelial cells and attacking the true skin, in which it causes minute rifts and splits and renders it sore and painful. Good soap, on the contrary, makes the skin smooth and soft.

Since the employment of poor soaps works so injuriously upon the skin, many persons never, or rarely ever, use soap, but wash the face in water alone, or with a little almond bran added. Their skins cannot bear the regular application of poor soap. This, however, applies only to poor, free-alkali containing soaps. Any skin can bear without injury any amount of a good toilet soap, free from uncombined alkali and other impurities. The habit of washing the face with water only, without the use of soap, must be regarded as one altogether bad, since the deposits on the skin, mostly dust-particles and dead epithelial cells, mingling with the oily or greasy matter exuded from the fat glands of the skin—excellent nutrient media for colonies of bacteria—cannot be got rid of by water alone. Rubbing only forces the mass into the openings in the skin (the sweat glands, fat glands, etc.), and stops them up. In this way are produced the so-called "black heads" and other spots and blotches on the skin usually referred to by the uneducated, or partially educated, as "parasites." The complexion is in this manner injured quite as much by the failure to use good soap as by the use of a poor or bad article.

All of the skin troubles referred to may be totally avoided by the daily use of a neutral, alkali-free soap, and the complexion thus kept fresh and pure. Completely neutral soaps, however, are more difficult to manufacture—requiring more skill and care than those in which no attention is paid to excess of alkali—and consequently cost more than the general public are accustomed, or, in fact, care to pay for soaps. While this is true, one must not judge the quality of a soap by the price demanded for it. Some of the manufacturers of miserable soaps charge the public some of the most outrageous prices. Neither can a soap be judged by its odor or its style of package and putting on the market.

To give a soap an agreeable odor the manufacturers add to it, just when it commences to cool off, an etheric oil (such as attar of rose, oil of violets, bergamot oil, etc.), or some balsamic material (such as tincture of benzoin, for instance). It should be known, however, that while grateful to the olfactory nerves, these substances do not add one particle to the value of the soap, either as a detergent or as a preserver of the skin or complexion.

Especially harmful to the skin are soaps containing foreign substances, such, for instance, as the starches, gelatin, clay, chalk, gums, or rosins, potato flour, etc., which are generally added to increase the weight of soap. Such soaps are designated, very significantly, "filled soaps," and, as a class, are to be avoided, if for no other reason, on account of their lack of true soap content. The use of these fillers should be regarded as a criminal falsification under the laws regarding articles of domestic use, since they are sold at a relatively high price, yet contain foreign matter, harmful to health.

RECIPES FOR COLD-STIRRED TOILET SOAPS.

		Parts by weight
I.—	Cocoanut oil	30
	Castor oil	3
	Caustic soda lye (38° Bé)	17½

Pink Soap.—

		Parts by weight
II.—	Pink No. 114	10
	Lemon oil	60
	Cedar-wood oil	60
	Citronella oil	50
	Wintergreen oil	15

Pale-Yellow Soap.—

		Parts by weight
III.—	Orange No. 410	10
	Citronella oil	60
	Sassafras oil	60
	Lavender oil	45
	Wintergreen oil	15
	Aniseed oil	25

Toilet Soap Powder.—

Marseilles soap, powdered	100 parts
Bran of almonds	50 parts
Lavender oil	5 parts
Thyme oil	3 parts
Spike oil	2 parts
Citronella oil	2 parts

Soft Toilet Soaps.—Soft toilet soaps or creams may be prepared from fresh lard with a small addition of cocoanut oil and caustic potash solution, by the cold process or by boiling. For the cold process, 23 parts of fresh lard and 2 parts of Cochin cocoanut oil are warmed in a jacketed pan, and when the temperature reaches 113° F. are treated with 9 parts of caustic potash and 2½ parts of caustic soda solution, both of 38° Bé. strength, the whole being stirred until saponification is complete. The soap is transferred to a large marble mortar and pounded along with the following scenting ingredients: 0.15 parts of oil of bitter almonds and 0.02 parts of oil of geranium rose, or 0.1 part of the latter, and 0.05 parts of lemon oil. The warm process is preferable, experience having shown that boiling is essential to the proper saponification of the fats. In this method, 80 parts of lard and 20 parts of Cochin cocoanut oil are melted together in a large pan, 100 parts of potash lye (20° Bé.) being then crutched in by degrees, and the mass raised to boiling point. The combined influence of the heat and crutching vaporizes part of the water in the lye, and the soap thickens. When the soap has combined, the fire is made up, and another 80 parts of the same potash lye are crutched in gradually. The soap gets thicker and thicker as the water is expelled and finally throws up "roses" on the surface, indicating that it is nearly finished. At this stage it must be crutched vigorously, to prevent scorching against the bottom of the pan and the resulting more or less dark coloration. The evaporation period may be shortened by using only 50 to 60 parts of lye at first, and fitting with lye of 25° to 30° strength. For working on the large scale iron pans heated by steam are used, a few makers employing silver-lined vessels, which have the advantage that they are not attacked by the alkali. Tinned copper pans are also useful. The process takes from 7 to 8 hours, and when the soap is finished it is transferred into stoneware vessels for storage. Clear vegetable oils (castor oil) may be used, but the soaps lack the requisite nacreous luster required.

TRANSPARENT SOAPS.

The mode of production is the same for all. The fats are melted together, sifted into a double boiler, and the lye is stirred in at 111° F. Cover up for an hour, steam being allowed to enter slowly. There is now a clear, grain-like soap in the kettle, into which the sugar solution and the alcohol are crutched, whereupon the kettle is covered up. If cuttings are to be used, they are now added. When same are melted, the kettle will contain a thin, clear soap, which is colored and scented as per directions, and subsequently filled into little iron molds and cooled.

Rose-Glycerine Soap.—

I.—	Cochin cocoanut oil	70,000 parts
	Compressed tallow	40,000 parts
	Castor oil	30,000 parts
	Caustic soda lye, 38° Bé	79,000 parts
	Sugar	54,000 parts
Dissolved in		
	Water	60,000 parts
	Alcohol	40,000 parts
	Geranium oil (African)	250 parts
	Lemon oil	200 parts
	Palmarosa oil	1,200 parts
	Bergamot oil	80 parts

Benzoin-Glycerine Soap.—

II.—	Cochin cocoanut oil	66,000 parts
	Compressed tallow	31,000 parts

Castor oil........	35,000 parts
Caustic soda lye, 38° Bé........	66,000 parts
Sugar...........	35,000 parts
Dissolved in	
Water...........	40,000 parts
Alcohol.........	35,000 parts
Brown, No. 120...	200 parts
Powdered benzoin (Siam)........	4,200 parts
Styrax liquid.....	1,750 parts
Tincture of benzoin...........	1,400 parts
Peru balsam.....	700 parts
Lemon oil.......	200 parts
Clove oil........	70 parts

Sunflower-Glycerine Soap.—

III.—Cochin cocoanut oil...........	70,000 parts
Compressed tallow...........	50,000 parts
Castor oil........	23,000 parts
Caustic soda lye, 39° Bé........	71,000 parts
Sugar...........	40,000 parts
Dissolved in	
Water...........	30,000 parts
Alcohol.........	40,000 parts
Brown, No. 55...	250 parts
Geranium oil.....	720 parts
Bergamot oil.....	300 parts
Cedar-wood oil...	120 parts
Palmarosa oil....	400 parts
Vanillin.........	10 parts
Tonka tincture...	400 parts

MISCELLANEOUS FORMULAS:

Szegedin Soap.—Tallow, 120 parts; palm kernel oil, 80 parts. Saponify well with about 200 parts of lye of 24° Bé. and add, with constant stirring, the following fillings in rotation, viz., potash solution, 20° Bé., 150 parts, and cooling salt solution 20° Bé., 380 parts.

Instrument Soap.—A soap for cleaning surgical instruments, and other articles of polished steel, which have become specked with rust by exposure, is made by adding precipitated chalk to a strong solution of cyanide of potassium in water, until a cream-like paste is obtained. Add to this white castile soap in fine shavings, and rub the whole together in a mortar, until thoroughly incorporated. The article to be cleaned should be first immersed, if possible, in a solution of 1 part of cyanide of potash in 4 parts of water, and kept there until the surface dirt and rust disappears. It should then be polished with the soap, made as above directed.

Stain-Removing Soaps.—These are prepared in two ways, either by making a special soap, or by mixing ordinary soap with special detergents. A good recipe is as follows:

I.—Ceylon cocoanut or palm seed oil	320 pounds
Caustic soda lye, 38° Bé........	160 pounds
Carbonate of potash, 20° Bé....	56 pounds
Oil of turpentine.	9 pounds
Finely powdered kieselguhr.....	280 pounds
Brilliant green....	2 pounds

The oil having been fused, the dye is mixed with some of it and stirred into the contents of the pan. The kieselguhr is then crutched in from a sieve, then the lye, and then the carbonate of potash. These liquids are poured in in a thin stream. When the soap begins to thicken, add the turpentine, mold, and cover up the molds.

II.—Rosin grain soap.	1,000 pounds
Talc (made to a paste with weak carbonate of potash).......	100 pounds
Oil of turpentine.	4 pounds
Benzine.........	3 pounds

Mix the talc and soap by heat, and when cool enough add the turpentine and benzine, and mold.

III.—Cocoanut oil.....	600 pounds
Tallow..........	400 pounds
Caustic soda lye..	500 pounds
Fresh ox gall.....	200 pounds
Oil of turpentine.	12 pounds
Ammonia (sp. gr., 0.91)..........	6 pounds
Benzine.........	5 pounds

Saponify by heat, cool, add the gall and the volatile liquids, and mold.

Soap Substitutes.—

I.—Linseed oil.........	28 pounds
Sulphur...........	8 pounds
Aluminum soap....	28 pounds
Oil of turpentine....	4 pounds
II.—Aluminum soap....	15 pounds
Almadina..........	25 pounds
Caoutchouc........	50 pounds
Sulphur..........	6 pounds
Oleum succini......	4 pounds

Shampoo Soap.—

Linseed oil..........	20 parts
Malaga olive oil.....	20 parts
Caustic potash.......	9½ parts
Alcohol...........	1 part
Water.............	30 parts

Warm the mixed oils on a large water bath, then the potash and water in another vessel, heating both to 158° F., and adding the latter hot solution to the hot oil while stirring briskly. Now add and thoroughly mix the alcohol. Stop stirring, keep the heat at 158° F. until the mass becomes clear and a small quantity dissolves in boiling water without globules of oil separating. Set aside for a few days before using to make the liquid soap.

The alcohol may be omitted if a transparent product is immaterial.

Sapo Durus.—

Olive oil.	100 parts
Soda lye, sp. gr., 1.33.	50 parts
Alcohol (90 per cent).	30 parts

Heat on a steam bath until saponification is complete. The soap thus formed is dissolved in 300 parts of hot distilled water, and salted out by adding a filtered solution of 25 parts of sodium chloride and 5 parts of crystallized sodium carbonate in 80 parts of water.

Sapo Mollis.—

Olive oil.	100 parts
Solid potassium hydroxide.	21 parts
Water.	100 parts
Alcohol (90 per cent).	20 parts

Boil by means of a steam bath until the oil is saponified, adding, if necessary, a little more spirit to assist the saponification.

Sand Soap.—Cocoa oil, 24 parts; soda lye, 38° Bé., 12 parts; sand, finely sifted, 28 parts; cassia oil, .0100 parts; sassafras oil, .0100 parts.

Salicylic Soap.—When salicylic acid is used in soap it decomposes, as a rule, and an alkali salicylate is formed which the skin does not absorb. A German chemist claims to have overcome this defect by thoroughly eliminating all water from potash or soda soap, then mixing it with vaseline, heating the mixture, and incorporating free salicylic acid with the resulting mass. The absence of moisture prevents any decomposition of the salicylic acid.

Olein Soap Substitute.—Fish oil or other animal oil is stirred up with sulphuric acid, and then treated with water. After another stirring, the whole is left to settle, and separate into layers, whereupon the acid and water are drawn off, and caustic soda solution is stirred in with the oil. The finishing stage consists in stirring in refined mineral oil, magnesium chloride, borium chloride, and pure seal or whale oil, in succession.

Mottled Soap.—Tallow, 30 parts; palm kernel oil, 270 parts; lye, 20°, 347½ parts; potassium chloride solution, 20°, 37½ parts. After everything has been boiled into a soap, crutch the following dye solution into it: Water, 5½ parts; blue, red, or black, .0315 parts; water glass, 38°, 10 parts; and lye, 38°, 1½ parts.

Laundry Soap.—A good, common hard soap may be made from clean tallow or lard and caustic soda, without any very special skill in manipulation. The caustic soda indicated is a crude article which may now be obtained from wholesale druggists in quantities to suit, at a very moderate price. A lye of average strength is made by dissolving it in water in the proportion of about 2 pounds to the gallon. For the saponification of lard, a given quantity of the grease is melted at a low heat, and ¼ its weight of lye is then added in small portions with constant stirring; when incorporation has been thoroughly effected, another portion of lye equal to the first is added, as before, and the mixture kept at a gentle heat until saponification appears to be complete. If the soap does not readily separate from the liquid, more lye should be added, the soap being insoluble in strong lye. When separation has occurred, pour off the lye, add water to the mass, heat until dissolved, and again separate by the use of more strong lye or a strong solution of common salt. The latter part of the process is designed to purify the soap and may be omitted where only a cruder article is required. The soap is finally remelted on a water bath, kept at a gentle heat until as much water as possible is expelled, and then poured into frames or molds to set.

Dog Soap.—

Petroleum.	5	Parts by weight
Wax.	4	
Alcohol.	5	
Good laundry soap.	15	

Heat the petroleum, wax, and alcohol on a water bath until they are well mixed, and dissolve in the mixture the soap cut in fine shavings. This may be used on man or beast for driving away vermin.

Liquid Tar Soap (Sapo Picis liquidus).—

Wood tar.	25 parts
Hebra's soap spirit. . .	75 parts

Ox-Gall Soap for Cleansing Silk Stuffs.—To wash fine silk stuffs, such as

piece goods, ribbons, etc., employ a soap containing a certain amount of ox gall, a product that is not surpassed for the purpose. In making this soap the following directions will be found of advantage: Heat 1 pound of cocoanut oil to 100° F. in a copper kettle. While stirring vigorously add ½ pound of caustic soda lye of 30° Baumé. In a separate vessel heat ¼ pound of white Venice turpentine, and stir this in the soap in the copper kettle. Cover the kettle well, and let it stand, mildly warmed for 4 hours, when the temperature can be again raised until the mass is quite hot and flows clear; then add the pound of ox gall to it. Now pulverize some good, perfectly dry grain soap, and stir in as much of it as will make the contents of the copper kettle so hard that it will yield slightly to the pressure of the fingers. From 1 to 2 pounds is all the grain soap required for the above quantity of gall soap. When cooled, cut out the soap and shape into bars. This is an indispensable adjunct to the dyer and cleaner, as it will not injure the most delicate color.

SOAP-BUBBLE LIQUIDS.

I.—White hard soap...	25 parts
Glycerine.........	15 parts
Water............	1,000 parts
II.—Dry castile soap...	2 parts
Glycerine.........	30 parts
Water............	40 parts

"SOAP FLAKES":

Flaked soap	9 parts
Borax	1 part

To "flake" the soap, take hard, dry cakes of white soap and run them over an inverted plane, such as used by carpenters.

SODIUM HYPOSULPHITE:
See Photography.

SODIUM SILICATE AS A CEMENT:
See Adhesives, under Water-Glass Cements.

SODIUM SALTS, EFFERVESCENT:
See Salts.

Solders

SOLDERING OF METALS AND THE PREPARATION OF SOLDERS.

The object of soldering is to unite two portions of the same metal or of different metals by means of a more fusible metal or metallic alloy, applied when melted, and known by the name of solder. As the strength of the soldering depends on the nature of the solder used, the degree of strength required for the joint must be kept in view in choosing a solder. The parts to be joined must be free from oxide and thoroughly clean; this can be secured by filing, scouring, scraping, or pickling with acids. The edges must fit exactly, and be heated to the melting point of the solder. The latter must have a lower melting point than either of the portions of metal that require to be joined, and if possible only those metals should be chosen for solder which form alloys with them. The solder should also as far as possible have the same color and approximately the same strength as the article whose edges are to be united.

To remove the layers of oxide which form during the process of soldering, various so-called "fluxes" are employed. These fluxes are melted and applied to the joint, and act partly by keeping off the air, thus preventing oxidation, and partly by reducing and dissolving the oxides themselves. The choice of a flux depends on the quantity of heat required for soldering.

Solders are classed as soft and hard solders. Soft solders, also called tin solders or white solders, consist of soft, readily fusible metals or alloys, and do not possess much strength; they are easy to handle on account of their great fusibility. Tin, lead-tin, and alloys of tin, lead, and bismuth are used for soft solders, pure tin being employed only for articles made of the same metal (pure tin).

The addition of some lead makes the solder less fusible but cheaper, while that of bismuth lowers the melting point. Soft solders are used for soldering easily fusible metals such as Britannia metal, etc., also for soldering tin plate. To prepare solder, the metals are melted together in a graphite crucible at as low a temperature as possible, well stirred with an iron rod, and cast into ingots in an iron mold. To melt the solder when required for soldering, the soldering iron is used; the latter should be kept as free from oxidation as possible, and the part applied should be tinned over.

To make so-called "Sicker" solder, equal parts of lead and tin are melted together, well mixed, and allowed to stand till the mixture begins to set, the part still in a liquid condition being then poured off. This mixture can, however,